

Chapter 2

Analysis of Solvency, Liquidity, and Financial Flexibility

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Answers to Questions:

1. Solvency exists when the value of a firm's assets exceeds the value of its liabilities. Liquidity is impacted by the time an asset takes to be converted into cash and at what cost.

TEACHING NOTE: It may be helpful to observe the difference between "book value" solvency based on historical values reflected in accounting systems and "market value" solvency reflecting a combination of mark-to-market values and opportunity costs.

2. Liquidity may also be viewed as the ability of the firm to augment its future cash flows to cover any unforeseen needs or to take advantage of any unforeseen opportunities. This concept of liquidity is referred to as financial flexibility.
3. Sustainable growth rate refers to the growth in sales that can occur given a target profit margin, asset turnover, dividend policy, and debt ratio, such that the firm is not forced to issue new common stock. Thus the sustainable growth is that growth rate at which the firm can grow without raising additional external capital or having to change financial policies.
4. By comparing the balance sheet stock account, such as accounts receivable, to a related income statement flow variable, such as sales which results in a turnover ratio.
5. Lambda includes information about the volatility of expected cash flows. Thus lambda allows the analyst to assess the probability of running out of cash.
6. Perhaps the most important and useful piece of information is the dollar amount of cash provided or used by the firm's operating activities.
7. A current ratio of 2.00 indicates that the firm has \$2.00 of current assets for each dollar of current liabilities. A current liquidity index of 2.00 indicates that the firm has \$2.00 of cash resources available through cash flow and cash balances to cover each dollar of currently maturing debt. Liquidity focuses more on the ability to actually pay obligations from on-going operations while solvency is more general and is focused more on the coverage relationship between assets and liabilities.
8. Because it is focused on the conversion of asset and liability accounts into cash flow rather than just just being concerned about the relative sizes of the stocks of these accounts.

9. These two measures have a coverage component similar to the current ratio but they also have a time or flow dimension as a result of including a measure of cash flow which relates to the concept of liquidity.
10. A firm can have a high current ratio, for example, by having a large balance of uncollectible receivables and obsolete inventory that is financed by long-term funds. Liquidity measures would then be relatively low if these assets are not generating cash flow.
11. This is an open ended response but one can refer back to the answer to question 3.

Solutions to Problems: Chapter 2

1. Calculating Lambda.

ASSUMPTIONS

<u>Year</u>	<u>Forecasted Cash Flow</u>	<u>End of Year Cash Assets</u>		<u>Lambda</u>
1994	15			
1995	0			
1996	-1	3		
1997	2	0	$(3+2) / (16/6) = *$	1.875
1998	4	5	$(0+4) / (3/6) = **$	8.0
1999	8	2	$(5+8) / (5/6) =$	15.6
2000	0	0	$(2+0) / (6/6) =$	2.0
2001	2	5	$(0+2) / (8/6) =$	1.5
2002	-1	4	$(5+(-1)) / (8/6) =$	3.0
2003	5	1	$(4+5) / (3/6) =$	18.0
2004	8		$(1+8) / (6/6) =$	9.0

*Note: Dividing the range by 6 is a simple approximation to the standard deviation.

**Note: From 1995 to 1997, the *largest difference* is between 2 and -1 = 3..

***Note: This implies about a 30% chance of running out of cash.

$$\text{Lambda} = \frac{\text{Initial Liquid Reserve} + \text{Total anticipated net cash flow during the analysis horizon}}{\text{Uncertainty about the net cash flow during the analysis horizon}} = \text{Cash flow per deviation}$$

The firm generally has excessive liquidity . Remember that a lambda of 3 implies about a 1/1000chance that the firm will run out of cash. A lambda of 2 gives a 2.25% probability of running out of cash.

2.

$$\text{Lambda} = \frac{\begin{array}{l} \text{Initial} \quad \text{Total anticipated net cash flow} \\ \text{Liquid} \quad + \quad \text{during the analysis horizon} \\ \text{Reserve} \end{array}}{\text{Uncertainty about the net cash flow during the analysis horizon}}$$

- a. $\text{Lambda} = (\$500 + \$3,000)/\$2,127 = 1.646$; Probability of cashout = 5%
 b. $\text{Lambda} = (\$1,000 + \$200)/\$729 = 1.646$; Probability of cashout = 5%
 c. $\text{Lambda} = (\$100 + \$1,500)/\$972 = 1.646$; Probability of cashout = 5%

Explanation: Although it is counterintuitive, all three scenarios have the same probability of a “cashout” due to illiquidity. Scenario “a” has the largest anticipated net cash flow for the coming period but low initial reserves and high cash flow uncertainty (variability); scenario “b” has high initial reserves but low net cash flow and low uncertainty; scenario “c” has moderate anticipated cash flow, low reserves, but relatively low uncertainty. The three competing factors equally and exactly offset each other to produce identical liquidity positions.

3. Calculating and interpreting ratios (shaded areas used in calculations).

ASSUMPTIONS:

Balance Sheets

<i>(current assets shaded)</i>	2000	2001	2002	2003	2004
Cash & Equivalents	\$75	\$75	\$90	\$100	\$100
Accounts Receivable	300	400	600	550	500
Inventory	150	250	350	250	250
Gross Fixed Assets	700	800	900	900	900
<u>(Accumulated Depr)</u>	<u>(75)</u>	<u>(125)</u>	<u>(190)</u>	<u>(260)</u>	<u>(335)</u>
Total Assets	\$1,150	\$1,400	\$1,750	\$1,540	\$1,415

(current liabilities shaded)

Accounts Payable	\$125	\$175	\$250	\$225	\$200
Notes Payable	165	162	178	136	99
Accrued Operating Exp.	10	63	65	49	36
Current Maturities	50	98	100	40	40
Long-Term Debt	600	500	400	200	150
<u>Shareholders Equity</u>	<u>200</u>	<u>402</u>	<u>757.2</u>	<u>890.2</u>	<u>890.2</u>
Total Liabilities & NW	\$1,150	\$1,400	\$1,750	\$1,540	\$1,415

Income Statements

Revenues (Sales)	\$1,500	\$2,250	\$3,000	\$2,000	\$1,500
Cost of Goods Sold	600	900	1,200	800	600
Operating Expenses	600	797	895	750	725
Depreciation	35	50	65	70	75
Interest	30	33	28	25	10
Taxes	94	188	325	142	36
Net Profit	141	282	487.2	213	54
Dividends	40	80	132	80	54

a.) SOLVENCY RATIOS	2000	2001	2002	2003	2004
Current Ratio	1.50	1.46	1.75	2.00	2.27
Quick Ratio	1.07	0.95	1.16	1.44	1.60
NWC	175	227	447	450	475
WCR	315	412	635	526	514
NLB	-140	-185	-188	-76	-39
WCR/S	21.00%	18.31%	21.17%	26.30%	34.27%

Example of calculations for 2000:

$$\text{Current Ratio} = \text{CA} / \text{CL} = (\text{CASH} + \text{A/R} + \text{INV}) / (\text{A/P} + \text{NP} + \text{ACC} + \text{CMLTD})$$

$$= (75 + 300 + 150) / (125 + 165 + 10 + 50) = 1.50$$

$$\text{Quick Ratio} = (\text{CA} - \text{INV}) / \text{CL} = (75 + 300) / (125 + 165 + 10 + 50) = 1.07$$

$$\text{NWC} = \text{CA} - \text{CL} = (75 + 300 + 150) - (125 + 165 + 10 + 50) = \$175$$

$$\text{WCR} = \text{AR} + \text{INV} + \text{PP} + \text{OTHER CA} - \text{AP} - \text{ACC} - \text{OTHER CL}$$

$$= 300 + 150 + 0 + 0 - 125 - 10 - 0 = \$315$$

$$\text{NLB} = \text{CASH} + \text{MS} - \text{NP} - \text{CMLTD} = 75 + 0 - 165 - 50 = -\$140$$

$$\text{WCR/S} = \text{WCR in relative terms (\% of sales)} = 315 / 1500 = 21\%$$

Discuss and interpret: As the numbers for the ratios indicate, the company's level of solvency is increasing each year (with the single exception of 2001 showing a slight downturn). The coverage of short-term creditors, as evidenced by the current ratio, for example, increases from \$1.50 of current assets per dollar of current liabilities in 2000 to \$2.27 of current assets for every dollar of current liabilities in 2004.

b.) Calculating operating cash flows.	2001	2002	2003	2004
Net Income	\$282	\$487	\$213	\$54
Depreciation	50	65	70	75
(Increase) decrease in AR	-100	-200	50	50
(Increase) decrease in INV.	-100	-100	100	0

Increase (decrease) in AP	50	75	-25	-25
Increase (decrease) in Accruals	53	2	-16	-13
Net Cash Flow From Operations	\$235	\$329	\$392	\$141

Example of calculations for 2001:

$$\text{Net Cash Flow} = 282 + 50 - 100 - 100 + 50 + 53 = \$235$$

Interpret the 4-year trend: While solvency generally increased with over a 10 percent increase in the current ratio from 2003 to 2004, the level of cash flow generated from operations declined significantly in 2004 from a level of \$392 for 2003 to \$141 for 2004.

c.) Calculating the cash conversion period.

$$\text{Days Sales Outstanding} = \text{Receivables} / (\text{Sales} / 365)$$

$$\text{Days Inventory Held} = \text{Inventory} / (\text{COGS} / 365)$$

$$\text{Days Payable Outstanding} = \text{Payables} / (\text{COGS} / 365) *$$

$$\text{Purchases} = \text{Ending inventory} - \text{Beginning inventory} + \text{Cost of Goods Sold}$$

$$\text{Operating Cycle} = \text{Days Sales Outstanding} + \text{Days Inventory Held}$$

$$\text{Cash Conversion Period} = \text{Operating Cycle} - \text{Days Payable Outstanding}$$

***Note:** As an approximation, and for reasons outlined in footnote 7 in the text, COGS will be used instead of Purchases in the calculations below.

Example of Calculations for 2000

$$\text{DSO} = \text{Receivables} / (\text{Sales} / 365) = 300 / (1500 / 365) = 73.00$$

$$\text{DIH} = \text{Inventory} / (\text{COGS} / 365) = 150 / (600 / 365) = 91.25$$

$$\text{DPO} = \text{Payables} / (\text{COGS} / 365) = (125 / 600) * 365 = 76.04$$

$$\text{Operating Cycle (OC)} = \text{DSO} + \text{DIH} = 73.00 + 91.25 = 164.25$$

$$\text{CCP} = \text{OC} - \text{DPO} = 164.25 - 76.04 = 88.21$$

	2000	2001	2002	2003	2004	
Days Sales Outstanding		73.00	64.89	73.00	100.38	121.67
Days Inventory Held		91.25	101.39	106.46	114.06	152.08
Days Payables Out		76.04	70.97	76.04	102.66	121.67
Operating Cycle		164.25	166.28	179.46	214.44	273.75
Cash Conversion Period		88.21	95.31	103.42	111.78	152.08

Interpret the 4-year trend: The cash conversion period shows a steadily worsening trend over the five year period. It reaches its highest level in 2004, consistent with the lowest level of cash flow generated for the five years.

d.) Calculating the current liquidity index.

Use assumptions below plus Balance Sheet above

ASSUMPTIONS (**Note:** the cash flows in this section are intentionally different from the actual cash flows calculated from the financial statement so that the correct cash flow numbers are not given away to the student.)

Year	Cash Flow	Liquidity Index
2001	\$250	1.51
2002	\$400	1.83
2003	\$350	1.58
2004	\$130	1.31

$$\text{Liquidity Index} = \frac{\text{Cash Assets (t - 1) + Cash Flow From Operations (t)}}{\text{Notes Payable (t - 1) + Current Maturing Debt (t - 1)}}$$

Example calculation for 2001: $LI = (75 + 250) / (165 + 50) = 1.51$

Interpret the 4-year trend: Notice the departure of trend in 2002. The current ratio increased while the liquidity index decreased.

e.) Current ratio versus liquidity index.

	2001	2002	2003	2004
Liquidity Index	1.51	1.83	1.85	1.31
Current Ratio	1.46	1.75	2.00	2.27

Interpretation: Notice the departure of trend in 2004. The comparison between cash flow, or liquidity measures (such as the liquidity index) and solvency measures (such as the current ratio) do indeed measure different aspects of the company's financial condition. In this case, the increasing balances in receivables and inventory add to the numerator of the current ratio which adds to the solvency measure, but on the other hand reduces the liquidity of the organization as more and more resources are tied up in slower moving receivables and inventory.

f.) Interpretation of the firm's liquidity position.

Although solvency (as shown by the current ratio) has increased, the company's liquidity position (as shown by the liquidity index, as well as by the level of operating cash flow and the cash conversion period) indicate a tightening of liquidity as the company's sales fall. The level of liquidity peaked in 2003 and fell in 2004 while the level of solvency continued to rise in 2004.

4. Sustainable sales growth versus actual sales growth.

ASSUMPTIONS	2000	2001	2002	2003	2004
<i>(current assets shaded)</i>					
Cash & Equivalents	\$75	\$75	\$90	\$100	\$100
Accounts Receivable	300	400	600	550	500
Inventory	150	250	350	250	250

Gross Fixed Assets	700	800	900	900	900
(Accumulated Depr)	(75)	(125)	(190)	(260)	(335)
Total Assets	<u>\$1,150</u>	<u>\$1,400</u>	<u>\$1,750</u>	<u>\$1,540</u>	<u>\$1,415</u>

(current liabilities shaded)

Accounts Payable	\$125	\$175	\$250	\$225	\$200
Notes Payable	165	162	178	136	99
Accrued Operating Exp.	10	63	65	49	36
Current Maturities	50	98	100	40	40
Long-Term Debt	600	500	400	200	150
Shareholders Equity	<u>200</u>	<u>402</u>	<u>757.2</u>	<u>890.2</u>	<u>890.2</u>
Total Liabilities & NW	<u>\$1,150</u>	<u>\$1,400</u>	<u>\$1,750</u>	<u>\$1,540</u>	<u>\$1,415</u>

Revenues (Sales)	\$1,500	\$2,250	\$3,000	\$2,000	\$1,500
Cost of Goods Sold	600	900	1,200	800	600
Operating Expenses	600	797	895	750	725
Depreciation	35	50	65	70	75
Interest	30	33	28	25	10
Taxes	94	188	325	142	36
Net Profit	141	282	487	213	54
Dividends	40	80	132	80	54

$$g^* = \text{sustainable growth rate} = \frac{m * (1 - d) * [1 + (D / E)]}{A/S - \{m * (1 - d) * [1 + (D / E)]\}}$$

S = prior year sales

gS = change in sales during the planning year, where g is the sales growth rate

A / S = target ratio of total assets to total sales

m = projected after-tax profit ratio

d = target dividend payout ratio (ratio of dividends to earnings)

D / E = target debt-to-equity ratio

Example of calculation for 2001 (using 2000 parameters):

$$g^* = \frac{0.0940 * (1 - 0.2837) * (1 + 4.75)}{0.7667 - 0.0940 * (1 - 0.2837) * (1 + 4.75)} = 102.02\%$$

	2000	2001	2002	2003	2004
S =	1,500.00	2,250.00	3,000.00	2,000.00	1,500.00
gS =	-----	0.5000	0.3333	(0.3333)	(0.2500)
A/S =	0.7667	0.6222	0.5833	0.7700	0.9433
m =	0.0940	0.1253	0.1624	0.1065	0.0360
d =	0.2837	0.2837	0.2709	0.3756	1.0000

D/E = 4.7500 2.4826 1.3114 0.7302 0.5898

Note: Numbers in the table have been carried to 4 decimal places due to the sensitivity of the g^* calculation.

Sustainable Growth Rate (g^*)	102.02%	101.00%	88.38%	17.57%
<i>(Based on prior year ratios)</i>				
Actual Sales Growth Rate	50.00%	33.33%	-33.33%	-25.00%

Interpretation: To calculate the sustainable growth rate for a particular year, we use the numbers for the previous year. In other words, the financial numbers, for example, for 2000 determine the rate of sustainable growth for 2001. The calculated sustainable growth rate for 2001 is then compared to the actual growth rate for 2001. For example, the company's sales grew 50 percent from 1998 to 1999 while the sustainable growth rate was calculated to be 102.02 percent. Based on the financial policies of the firm at the end of 2000, the company actually had the ability to grow at a higher rate than it did without straining the company's financial resources. Since the company grew at a slower rate, it was able to pay down some of its debt and lower its debt to equity ratio.

5. Calculating and interpreting short-term financial ratios:

ASSUMPTIONS	2000	2001	2002	2003	2004
<i>(current assets shaded)</i>					
Cash & Equivalents	\$25	\$75	\$100	\$50	\$25
Accounts Receivable	450	700	1,200	2,000	3,000
Inventory	400	500	800	1,400	2,500
Gross Fixed Assets	1,000	1,000	1,500	1,500	2,500
(Accumulated Depr)	(200)	(250)	(350)	(400)	(550)
Total Assets	\$1,675	\$2,025	\$3,250	\$4,550	\$7,475

<i>(current liabilities shaded)</i>					
Accounts Payable	\$100	\$200	\$400	\$700	\$1,226
Notes Payable	50	275	1,092	598	1,550
Accrued Operating Exp.	60	55	60	70	80
Current Maturities	50	50	50	50	200
Long-Term Debt	400	382	330	1,508	2,315
Shareholders Equity	1,015	1,063	1,318	1,624	2,104
Total Liabilities & NW	\$1,675	\$2,025	\$3,250	\$4,550	\$7,475

Revenues (Sales)	\$1,500	\$2,250	\$3,750	\$5,500	\$9,000
Cost of Goods Sold	750	1,125	1,875	2,750	4,500
Operating Expenses	700	750	900	1,600	2,500
Depreciation	100	50	100	50	150

Interest	40	45	100	200	400
Taxes	(36)	112	310	360	580
Net Profit	(54)	168	465	540	870
Dividends	45	120	210	234	390

a.) SOLVENCY RATIOS	2000	2001	2002	2003	2004
Current Ratio	3.37	2.20	1.31	2.43	1.81
Quick Ratio	1.83	1.34	0.81	1.45	0.99
NWC	615	695	498	2032	2469
WCR	690	945	1540	2630	4194
NLB	-75	-250	-1042	-598	-1725
WCR / S	46.00%	42.00%	41.07%	47.82%	46.60%

Example of calculations for 2000 (see definitions in problem 3):

$$\text{Current Ratio} = (25 + 450 + 400) / (100 + 50 + 60 + 50) = 3.365$$

$$\text{Quick Ratio} = (25 + 450) / (100 + 50 + 60 + 50) = 1.827$$

$$\text{NWC} = (25 + 450 + 400) - (100 + 50 + 60 + 50) = \$615$$

$$\text{WCR} = (450 + 400 + 0 + 0) - (100 + 60 + 0) = \$690$$

$$\text{NLB} = 25 + 0 - 50 - 50 = -\$75$$

$$\text{WCR} / S = (690 / 1500) * 100 = 46.0\%$$

Discuss and interpret the trends: As the numbers for the current and quick ratios indicate, company's level of solvency first declined from 2000 to 2002, then increased for two years, and then declined during the last year. The level of net working capital and working capital requirements rose and fell also, but they ended the five-year period at a substantially higher level than they began with in 2000 because of the general growth of the company.

b.) Calculating operating cash flows.	2001	2002	2003	2004
Net Income	\$168	\$465	\$540	\$870
Depreciation	50	100	50	150
(Increase) decrease in AR	(250)	(500)	(800)	(1,000)
(Increase) decrease in INV.	(100)	(300)	(600)	(1,100)
Increase (decrease) in AP	100	200	300	526
Increase (decrease) in Accruals	(5)	5	10	10
Net Cash Flow From Operations	(\$37)	(\$30)	(\$500)	(\$544)

Example of calculations for 2001:

$$\text{Net Cash Flow} = 168 + 50 - 250 - 100 + 100 - 5 = (37)$$

Interpret the 4-year trend: The level of cash flow from operations shows a decidedly bleak picture with the company running an increasing deficit cash flow position.

c.) Calculating the cash conversion period.

Days Sales Outstanding = Receivables / (Sales / 365)

Days Inventory Held = Inventory / (COGS / 365)

Days Payable Outstanding = Payables / (COGS / 365)

Purchases = Ending inventory - Beginning inventory + Cost of Goods Sold

Operating Cycle = Days Sales Outstanding + Days Inventory Held

Cash Conversion Period = Operating Cycle - Days Payable Outstanding

Example of calculations for 2000:

***Note:** As an approximation, and for reasons outlined in footnote 7 in the text, COGS will be used instead of Purchases in the calculations below.

DSO = Receivables / (Sales / 365) = 450 / (1500 / 365) = 109.50

DIH = Inventory / (COGS / 365) = 400 / (750 / 365) = 194.67

DPO (using COGS in denominator vs. Purchases) = (100 / 750) * 365 = 48.67

Operating Cycle (OC) = DSO + DIH = 304.17

CCP = Operating Cycle (OC) - DPO = 304.17 - 48.67 = 255.50

	2000	2001	2002	2003	2004
Days Sales Outstanding	109.50	113.56	116.80	132.73	121.67
Days Inventory Held	194.67	162.22	155.73	185.82	202.78
Days Payable Outstanding NA	48.67	64.89	77.87	92.91	99.44
Operating Cycle	304.17	275.78	272.53	318.55	324.44
Cash Conversion Period NA	255.50	210.89	194.67	225.64	225.00

Interpret the 5-year trend: The cash conversion period shows a general decline, falling from 255 days to over 225 days. This increase of cash conversion is due to a slowing in the payout to the company's suppliers even though days sales outstanding increased as did the number of days inventory is held.

d.) Use assumptions below plus Balance Sheet above:

ASSUMPTIONS (**Note:** the cash flows in this section are intentionally different from the actual cash flows calculated from the financial statement so that the correct cash flow numbers are not given away to the student.)

Year	Cash Flow	Liquidity Index
2001	40	0.65
2002	-75	0.00
2003	-550	-0.39
2004	-650	-0.93

$$\text{Liquidity Index} = \frac{\text{Cash Assets (t - 1)} + \text{Cash Flow From Operations (t)}}{\text{Notes Payable (t - 1)} + \text{Current Maturing Debt (t - 1)}}$$

Example of calculation for 2001: LI = (25 + 40) / (50 + 50) = 0.65

Interpret the 4-year trend: Based on the cash flow numbers provided for this section, the current liquidity index also indicates a very illiquid position with a negative balance the last two years.

e.)	2001	2002	2003	2004
Liquidity Index	0.65	0.00	-0.39	-0.93
Current Ratio	2.20	1.31	2.43	1.81

Comparison of current ratio and liquidity index: Comparison of the current ratio with the current liquidity index indicates that the two ratios must indeed be measuring different aspects of the company's financial position. The current liquidity index indicates that the company does not have enough internal liquid resources to cover its maturing debt obligations while the level of the current ratio paints a less bleak picture of its ability to pay maturing obligations and maintain operations.

- f.) **Interpretation of the firm's liquidity position:** The company is in a very illiquid position and is unable to cover its currently maturing obligations with internal cash resources. Therefore it must refinance those obligations as evidenced by the increasing level of debt on the balance sheet.

6. Sustainable sales growth versus actual sales growth.

ASSUMPTIONS	2000	2001	2002	2003	2004
<i>(current assets shaded)</i>					
Cash & Equivalents	\$25	\$75	\$100	\$50	\$25
Accounts Receivable	450	700	1,200	2,000	3,000
Inventory	400	500	800	1,400	2,500
Gross Fixed Assets	1,000	1,000	1,500	1,500	2,500
(Accumulated Depr)	(200)	(250)	(350)	(400)	(550)
Total Assets	\$1,675	\$2,025	\$3,250	\$4,550	\$7,475
<i>(current liabilities shaded)</i>					
Accounts Payable	\$100	\$200	\$400	\$700	\$1,226
Notes Payable	50	275	1,092	598	1,550
Accrued Operating Exp.	60	55	60	70	80
Current Maturities	50	50	50	50	200
Long-Term Debt	400	382	330	1,508	2,315
Shareholders Equity	<u>1,015</u>	<u>1,063</u>	<u>1,318</u>	<u>1,624</u>	<u>2,104</u>
Total Liabilities & NW	\$1,675	\$2,025	\$3,250	\$4,550	\$7,475
Revenues (Sales)	\$1,500	\$2,250	\$3,750	\$5,500	\$9,000
Cost of Goods Sold	750	1,125	1,875	2,750	4,500
Operating Expenses	700	750	900	1,600	2,500
Depreciation	100	50	100	50	150
Interest	40	45	100	200	400
Taxes	(36)	112	310	360	580

Net Profit	(54)	168	465	540	870
Dividends	45	120	210	234	390

$$g^* = \text{sustainable growth rate} = \frac{m * (1 - d) * [1 + (D / E)]}{A / S - \{m * (1 - d) * [1 + (D / E)]\}}$$

	2000	2001	2002	2003	2004
S =	\$1,500	\$2,250	\$3,750	\$5,500	\$9,000
gS =	-----	0.5000	0.6667	0.4667	0.6364
A/S =	1.1167	0.9000	0.8667	0.8273	0.8306
m =	(0.0360)	0.0747	0.1240	0.0982	0.0967
d =	(0.8333)	0.7143	0.4516	0.4333	0.4483
D/E =	0.6502	0.9050	1.4659	1.8017	2.5528

Note: numbers in table have been carried to 4 decimal places due to sensitivity of g^* calculation. See definitions in problem 4.

Example of calculation for 2001 (using 2001 parameters):

$$g^* = \frac{[-0.0360 * (1 + 0.8333) * (1 + 0.6502)]}{1.1167 - (-0.0360) * (1 + 0.8333) * (1 + 0.6502)} = -8.886\%$$

Sustainable Growth Rate	- 8.89%	4.73%	23.99%	23.22%
<i>(Based on prior year ratios)</i>				
Actual Sales Growth Rate	50.00%	66.67%	46.67%	63.64%

Interpretation: In all years, the firm's actual growth rate exceed its sustainable growth rate. As a result, the company had to substantially increase its reliance of debt financing as evidenced by the significantly rising D/E ratio.

7. Calculating and interpreting short-term financial ratios:

ASSUMPTIONS	2000	2001	2002	2003	2004
<i>(current assets shaded)</i>					
Cash & Equivalents	\$25	\$75	\$100	\$50	\$25
Accounts Receivable	750	534	416	312	243
Inventory	125	157	160	138	121
Gross Fixed Assets	1,000	1,000	1,000	1,000	1,000
(Accumulated Depr)	(200)	(300)	(400)	(500)	(600)
Total Assets	\$1,700	\$1,466	\$1,276	\$1,000	\$ 789

(current liabilities shaded)

Accounts Payable	\$125	\$163	\$160	\$138	\$121
Notes Payable	850	300	141	47	0
Accrued Operating Exp.	100	75	50	40	30
Current Maturities	50	50	50	50	50

Long-Term Debt	0	303	300	150	88
Shareholders Equity	<u>575</u>	<u>575</u>	<u>575</u>	<u>575</u>	<u>500</u>
Total Liabilities & NW	\$1,700	\$1,466	\$1,276	\$1,000	\$789

Revenues (Sales)	\$9,000	\$5,500	\$3,750	\$2,500	\$1,750
Cost of Goods Sold	<u>4,500</u>	<u>2,750</u>	<u>1,875</u>	<u>1,250</u>	<u>875</u>
Operating Expenses	3,000	1,600	1,065	925	888
Depreciation	100	100	100	100	100
Interest	40	45	35	25	12
Taxes	<u>544</u>	<u>402</u>	<u>270</u>	<u>80</u>	<u>(50)</u>
Net Profit	816	603	405	120	(75)
Dividends	816	603	405	120	0

a.) SOLVENCY RATIOS	2000	2001	2002	2003	2004
Current Ratio	0.80	1.30	1.69	1.82	1.94
Quick Ratio	0.69	1.04	1.29	1.32	1.33
NWC	(225)	178	275	225	188
WCR	650	453	366	272	213
NLB	(875)	(275)	(91)	(47)	(25)
WCR / S	7.22%	8.24%	9.76%	10.88%	12.17%

Example of calculations for 2000 (see definitions in problem 3):

Current Ratio = $(25 + 750 + 125) / (125 + 850 + 100 + 50) = 0.80$

Quick Ratio = $(25 + 750) / (125 + 850 + 100 + 50) = 0.69$

NWC = $(25 + 750 + 125) - (125 + 850 + 100 + 50) = (\$225)$

WCR = $(750 + 125 + 0 + 0) - (125 + 100 + 0) = \650

NLB = $25 + 0 - 850 - 50 = (\$875)$

WCR / S = $(650 / 9,000) * 100 = 7.22\%$

Discuss and interpret the trends: As the numbers for the current and quick ratios indicate, company's level of solvency is continually improving from 2000 to 2002 – but that is a very misleading picture. Liquidity as measured by NLB is likewise improving during that same time, but remains in poor condition. Note that revenue is declining substantially, and assets are shrinking to match. Working capital required is up slightly, but total working capital is down – indicating a slight time lag as the company pares asset levels in response to declining sales. This appears to be a company that is facing a severe market contraction. Management is trying to shrink assets in response and return capital

b.) Calculating operating cash flows.	2001	2002	2003	2004
Net Income	\$603	\$405	\$120	(\$75)
Depreciation	100	100	100	100
(Increase) decrease in AR	216	118	104	69
(Increase) decrease in INV.	(32)	(3)	22	17
Increase (decrease) in AP	38	(3)	(22)	(17)

Increase (decrease) in Accruals	(25)	(25)	(10)	(10)
Net Cash Flow From Operations	\$900	\$592	\$314	\$84

Example of calculations for 2001:

Net Cash Flow = $603 + 100 + 216 - 32 + 38 - 25 = 900$

Interpret the 4-year trend: Cash flows from operations decline as revenue declines..

c.) Calculating the cash conversion period.

Days Sales Outstanding = $\text{Receivables} / (\text{Sales} / 365)$

Days Inventory Held = $\text{Inventory} / (\text{COGS} / 365)$

Days Payable Outstanding = $\text{Payables} / (\text{COGS} / 365)$

Purchases = $\text{Ending inventory} - \text{Beginning inventory} + \text{Cost of Goods Sold}$

Operating Cycle = $\text{Days Sales Outstanding} + \text{Days Inventory Held}$

Cash Conversion Period = $\text{Operating Cycle} - \text{Days Payable Outstanding}$

Example of calculations for 2000:

***Note:** As an approximation, and for reasons outlined in footnote 7 in the text, COGS will be used instead of Purchases in the calculations below.

DSO = $\text{Receivables} / (\text{Sales} / 365) = 450 / (1500 / 365) = 109.50$

DIH = $\text{Inventory} / (\text{COGS} / 365) = 400 / (750 / 365) = 194.67$

DPO (using COGS in denominator vs. Purchases) = $(100 / 750) * 365 = 48.67$

Operating Cycle (OC) = $\text{DSO} + \text{DIH} = 304.17$

CCP = $\text{Operating Cycle (OC)} - \text{DPO} = 304.17 - 48.67 = 255.50$

	2000	2001	2002	2003	2004
Days Sales Outstanding	30.42	35.44	40.49	45.55	50.68
Days Inventory Held	10.14	20.84	31.15	40.30	50.47
Days Payable Outstanding	10.14	21.63	31.15	40.30	50.47
Operating Cycle	40.56	56.28	71.64	85.85	101.16
Cash Conversion Period	30.42	34.64	40.49	45.55	50.68

Interpret the 5-year trend: The cash conversion period shows a gradual increase over the five years, and it is apparent that this company is in severe financial difficulty. A careful reading of the numbers, however, suggests that the difficulty is more likely on the marketing side than poor financial management, as the firm appears to be making relatively rational financial decisions and is managing the severe decline with some financial grace. Revenues are declining, and the firm is attempting to make a graceful exit and return capital to shareholders. But the situation is gradually getting out of control, as DPO has

increased by 500% over 5 years, masking an even more modest degradation in collections (DPO) and a severe increase in inventory holding periods (DIH). Inventory levels are approximately the same as they were when sales were 5 times as high. The chances are good that much of the excess inventory is not saleable.

d.) Use assumptions below plus Balance Sheet above:

ASSUMPTIONS (Note: the cash flows in this section are intentionally different from the actual cash flows calculated from the financial statement so that the correct cash flow numbers are not given away to the student.)

Year	Cash Flow	Liquidity Index
2001	910	1.04
2002	600	1.93
2003	300	2.09
2004	100	1.55

$$\text{Liquidity Index} = \frac{\text{Cash Assets (t - 1) + Cash Flow From Operations (t)}}{\text{Notes Payable (t - 1) + Current Maturing Debt (t - 1)}}$$

Example of calculation for 2001: $LI = (25 + 910) / (850 + 50) = 1.04$

Interpret the 4-year trend: Based on the cash flow numbers provided for this section, the current liquidity index also indicates a very illiquid position with a negative balance the last two years.

e.)

	2001	2002	2003	2004
Liquidity Index	0.07	0.00	-2.36	-6.19
Current Ratio	1.30	1.69	1.82	1.94

Comparison of current ratio and liquidity index: Comparison of the current ratio with the current liquidity index indicates that the two ratios must indeed be measuring different aspects of the company's financial position. The current liquidity index indicates that the company does not have enough internal liquid resources to cover its maturing debt obligations while the level of the current ratio paints a positive picture of its ability to pay maturing obligations and maintain operations.

f.) Interpretation of the firm's liquidity position: The company is in a very illiquid position and is unable to cover its currently maturing obligations with internal cash resources.

8. Sustainable sales growth versus actual sales growth.

ASSUMPTIONS	2000	2001	2002	2003	2004
<i>(current assets shaded)</i>					
Cash & Equivalents	\$25	\$75	\$100	\$50	\$25

Accounts Receivable	750	534	416	312	243
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Current Maturities	50	50	50	50	50
Long-Term Debt	0	303	300	150	88
Shareholders Equity	575	575	575	575	500
Total Liabilities & NW	\$1,700	\$1,466	\$1,276	\$1,000	\$789

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Depreciation	100	100	100	100	100
Interest	40	45	35	25	12
Taxes	544	402	270	80	(50)
Net Profit	816	603	405	120	(75)
Dividends	816	603	405	120	0

$$g^* = \text{sustainable growth rate} = \frac{m * (1 - d) * [1 + (D / E)]}{A / S - \{m * (1 - d) * [1 + (D / E)]\}}$$

	2000	2001	2002	2003	2004
S =	\$9,000	\$5,500	\$3,750	\$2,500	\$1,750
gS =	-----	0.3889	0.3182	0.3333	0.3000
A/S =	0.1889	0.2665	0.3403	0.4000	0.4509
m =	(0.0907)	0.1096	0.1080	0.0480	0.0429
d =	1.000	1.000	1.000	1.000	1.000
D/E =	1.9565	1.5496	1.2191	0.7391	0.5780

Note: numbers in table have been carried to 4 decimal places due to sensitivity of g^* calculation. See definitions in problem 4.

Example of calculation for 2001 (using 2001 parameters):

$$g^* = \frac{[0.0907 * (1 - 1.0) * (1 + 1.9565)]}{0.2665 - \{0.0907 * (1 - 1.0) * (1 + 1.9565)\}} = 0.0\%$$

$$0.1889 - (0.0907) * (1 + 1.0) * (1 + 1.9565)$$

Sustainable Growth Rate	0.0%	0.0 %	0.0%	0.0%
<i>(Based on prior year ratios)</i>				
Actual Sales Growth Rate	38.89%	31.82%	33.33%	30.30%

Interpretation: Because the firm is paying out all of its net income as dividends (100% payout ratio), the second term in the numerator is “0”, thus the product of the calculation is 0. This is consistent with a conceptual review of the situation, wherein the firm is retaining no capital and thus has no fuel with which to grow.